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(54) Title: CHEWING GUM CONTAINING POLYDEXTROSE

(57) Abstract

Chewing gums containing polydextrose and methods of making such gums are disclosed. In one embodiment, the polydextrose is codried with other sweeteners or coevaporated with a plasticizing syrup to produce unique sweetening ingredients and syrups for gum. The polydextrose may also be provided in the form of a rolling compound on the gum, or used to form a hard coating for a coated pellet gum.

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CHEWING GUM CONTAINING POLYDEXTROSE

BACKGROUND OF THE INVENTION

The present invention relates to improved compositions of chewing gum. More particularly, the invention relates to improving chewing gum by the use of specific bulking agents in sugar and non-sugar chewing gum products to give improved texture, moisture absorption properties, and improved shelf life properties. The improved chewing gum compositions may also be used in a variety of chewing gum products such as confectionery coated chewing gum products.

In recent years, efforts have been devoted to replace sugar and sugar syrups normally found in chewing gum with other carbohydrates and noncarbohydrates. Non-sugar or sugar-free chewing gum, which is growing in popularity, uses sugar alcohols or polyols to replace sugar and sugar syrups. The most popular polyols are sorbitol, mannitol, and xylitol. New polyols are being developed using new technology to replace these polyols. New polyols have various unique properties which can improve the taste, texture, and shelf life properties of chewing gum for consumers.

The non-sugar polyols have the advantage of not contributing to dental caries of consumers, as well as being able to be consumed by diabetics. However, all polyols have the disadvantage of causing gastro-intestinal disturbances if consumed in too great of a quantity. Therefore it would be a great advantage

to be able to use a carbohydrate or carbohydrate-like food ingredient for chewing gum that would act as a bulking agent, but not contribute to dental caries nor cause as severe gastro-intestinal disturbances.

One such bulking agent is called polydextrose. This bulking agent or bulk sweetner is approved for use in human food products and in chewing gum in the U.S. Polydextrose is also approved in other countries in Europe and in Japan. Polydextrose is a randomly bonded condensation "recombined" polymer of dextrose containing minor amounts of bound sorbitol and citric acid. Although a carbohydrate, polydextrose does not contribute to dental caries, does not cause as significant gastro-intestinal disturbances as polyols, and does not significantly contribute to calories.

In 1973, Pfizer, Inc. of New York disclosed the manufacture of unique polyglucose compounds (polydextrose) compounds and their method of preparation in U.S. Patent No. 3,766,165.

The use of polydextrose has been disclosed in various food products in EPO Patent Publication No. 0 438 912, U.S. Patent No. 4,802,924, U.S. Patent No. 4,528,206 and U.S. Patent No. 5,009,900.

The use of polydextrose has also been disclosed in chewing gum formulations in EPO Patent Publication No. 0 252 874, U.S. Patent No. 4,765,991, EPO Patent Publication No. 0 398 465, U.S. Patent No. 5,066,511, Japanese Patent Publication No. 86 173748 and U.S. Patent No. 4,382,963.

When polydextrose was first introduced into the market, the product had low flavor quality. As a result, several patents disclosed methods of improving its quality. These are Japanese Patent Publication No. 91 020301 and U.S. Patent No. 4,948,596.

Pfizer, Inc. of New York has recently introduced a premium version of polydextrose that has

improved flavor quality and is marketing polydextrose under the tradename "Litesse."

SUMMARY OF THE INVENTION

The present invention is a method of producing chewing gum with a new bulk sweetener, specifically polydextrose, as well as the chewing gum so produced. The bulk sweetener may be added to sucrose-type gum formulations, replacing a small or large quantity of sucrose. The formulation may be a low- or high-moisture formulation containing low or high amounts of moisture-containing syrup. The bulk sweetener, polydextrose may also be used in low- or non-sugar gum formulations replacing sorbitol, mannitol, other polyols, or carbohydrates. Non-sugar formulations may include low- or high-moisture, sugar-free chewing gums.

The bulk sweetener, polydextrose, may be combined with other bulk sweeteners for use in chewing gum, including but not limited to sucrose, dextrose, fructose, maltose, maltodextrin, xylose, as well as sugar alcohols including but not limited to sorbitol, mannitol, xylitol, maltitol, lactitol, palatinit and Lycasin brand hydrogenated starch hydrolysates. The bulk sweetener, polydextrose, may be combined in the gum formulation or co-dried or blended with the other bulk sweeteners prior to use in the gum formulation. Co-drying may be done by various methods of spray drying, fluid bed coating, coacervation, and other granulating or agglomerating techniques. The bulk sweetener, polydextrose, may also be combined with high potency sweeteners including, but not limited to thaumatin, aspartame, acesulfame K, sodium saccharin, glycyrrhizin, alitame, cyclamate, stevioside, sucralose and dihydrochalcones.

This sweetener, polydextrose, when used

according to the present invention, gives chewing gum an improved texture, an improved shelf life and unique flavor/sweetness quality. Even though polydextrose has properties similar to sucrose, it is not cariogenic, contributes to dietary fiber and does not significantly contribute to calories, giving a highly consumer-acceptable chewing gum product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Polydextrose is a randomly bonded condensation polymer of dextrose containing minor amounts of bound sorbitol and citric acid. It is partially metabolized, resulting in a caloric utilization of about one calorie per gram. Polydextrose is commercially available from Pfizer, Inc. of New York, NY under the tradename "Litesse." Litesse is a water soluble, white-to-cream colored amorphous powder. It forms a clear melt above 130°C in a manner similar to sucrose. A 10% solution has a pH of 2.5 to 3.5.

Polydextrose may be used in food as a multi-purpose food additive in accordance with the US FDA. The regulation defines polydextrose as a partially metabolizable water soluble polymer prepared from D-glucose with small amounts of sorbitol and citric acid. Polydextrose is currently approved in the United States as a food ingredient for: frozen dairy desserts, baked goods and mixes, confections and frostings, salad dressings, gelatins, puddings and pie fillings, hard candy and soft candy, and chewing gum. No maximum use level has been established by the FDA.

Polydextrose is also approved by the following European nations: Austria, Belgium, Denmark, Finland, France, Ireland, the Netherlands, Norway, Sweden, Switzerland, and the UK. The Litesse brand of polydextrose is recognized as safe by the European

Scientific Committee for Foods. In Japan, polydextrose is considered a food and confirmed as safe, and may be used as a dietary fiber. It has also been confirmed that polydextrose has a caloric utilization of one calorie per gram, compared to four calories per gram for conventional sugars and carbohydrates.

Polydextrose has been developed by Pfizer, Inc. and several forms have been available. The original polydextrose was called polydextrose A. However, it contained some citric acid, which gave it a poor quality taste. To improve the taste, polydextrose K was developed, where the citric acid was neutralized with potassium carbonate. A liquid syrup version of polydextrose K was also available called polydextrose Type N at 70% solids. A further improved version of polydextrose has now been developed by Pfizer, Inc. where citric acid is significantly reduced and taste is improved. This polydextrose has the tradename of Litesse. Currently only polydextrose A and Litesse are commercially available. All of these materials have similar properties and are referred to herein generically as polydextrose.

Polydextrose may be added to chewing gum in its solid form or dissolved in syrup form. Its solubility in water is about 70% at room temperature, but increases with increased temperature. Polydextrose may be used in chewing gum as a texture and flavor modifier, bulking agent, and may improve texture, flavor, and shelf life properties. Polydextrose may replace solids like sucrose, dextrose, or lactose when used in its powder form, or may replace syrups when used in its liquid or syrup form. At levels of about 0.5% to about 25%, polydextrose may replace part of the solids in sugar gum or, as a liquid, all or part of the syrup in sugar gum. At higher levels of about 25% to

about 90% of the gum formulation, polydextrose may replace all of the solids in a chewing gum formulation.

Chewing gum formulations can be obtained where all bulk sweeteners are replaced with polydextrose powder and syrup. The relatively low sweetness intensity allows for use of unique flavor combinations. High intensity sweeteners may be added to increase sweetness to obtain more typical chewing gum formulations. Chewing gum formulations with polydextrose high in polydextrose solids would be softer but more hygroscopic than sugar-containing gum formulations. If a high level of polydextrose syrup is used in place of conventional syrup, the chewing gum formulations could be more hygroscopic and age to a softer product. Chewing gum formulations with polydexrose may contain a very low amount of moisture in the gum formulation, i.e., below about 2%, or may contain a medium amount of moisture, about 2-5%, and may even be a soft gum formulation containing 5% moisture or more.

Although polydextrose has properties like sucrose, its anti-caries properties suggest it may be used in chewing gum formulations containing non-sugar ingredients. Non-sugar ingredients are alditols such as sorbitol, mannitol, xylitol, lactitol, palatinit (Isomalt), maltitol and hydrogenated starch hydroylsates. These alditols are used in a variety of combinations to develop unique sugarless chewing gum formulations. Polydextrose may be used to replace the individual alditols or combinations of alditols. With partial replacement of one or more alditols, polydextrose can be used at levels of about 0.5-25%. If polydextrose replaces a large amount or most of the alditols, this level may be about 25% to about 90% of the gum formulation.

Some sugar-free chewing gum formulations contain high levels of glycerin and are very low in moisture, i.e., less than about 2%. Polydextrose solids or syrup may replace part or all of the glycerin used in these types of formulations. At higher moisture levels (more than 2%) in sugar-free gum, a liquid sorbitol (70% sorbitol, 30% water) is used. Polydextrose solids or polydextrose syrup may replace part or all of the sorbitol liquid. Sugar-free syrups like hydrogenated starch hydrolysates (HSH), such as Lycasin brand HSH, may also be replaced in part or totally by polydextrose solids or syrup. The same product advantages found with hydrogenated starch hydrolysates syrups, such as improved product shelf life, improved texture, and improved aspartame and alitame stability, may also be found with the use of polydextrose solids or syrup.

Recent advances use HSH and glycerin preblended and co-evaporated to reduce moisture in some sugar-free gum formulations. Polydextrose solids and/or syrup may be used to replace part or all of the HSH/glycerin blends in chewing gum formulations. Aqueous polydextrose solids and/or polydextrose syrup may also replace HSH in the pre-blend with glycerin and be co-evaporated with glycerin to obtain a low moisture, non-crystallizable blend. Combinations of polydextrose solids/syrup with alditols like sorbitol, maltitol, xylitol, lactitol and mannitol in aqueous form may also be blended with glycerin and co-evaporated for use in low-moisture, sugar-free gum.

In a similar manner, polydextrose solids/ syrup preblended in glycerin and co-evaporated may be used in conventional sugar chewing gum formulations. Polydextrose may be combined with other sugars like dextrose, sucrose, lactose, maltose, invert sugar,

fructose and corn syrup solids to form a liquid mix to be blended with glycerin and co-evaporated. Polydextrose solids/syrup may also be mixed with conventional syrup and blended with glycerin and co-evaporated for use in a sugar chewing gum formulation.

Polydextrose bulk sweetener may also be co-dried with a variety of sugars such as sucrose, dextrose, lactose, fructose, and corn syrup solids and used in a sugar-containing gum formulation. Polydextrose may be co-dried with a variety of sugars, such as sucrose, dextrose, lactose, fructose, and corn syrup solids, and used in a sugar-free gum formulation. Polydextrose may be co-dried with a variety of alditols, such as sorbitol, mannitol, xylitol, maltitol, palatinit and hydrogenated starch hydrolysates, and used in a sugar-free gum formulation. Co-drying refers to methods of co-crystallization and co-precipitation of polydextrose with other sugars and alditols, as well as co-drying by encapsulation, agglomeration, and absorption with other sugars and alditols.

Co-drying by encapsulation, agglomeration, and absorption can also include the use of encapsu- lating and agglomerating agents. Polydextrose may be mixed with other sugars or alditols prior to being redried by encapsulation or agglomeration, or may be used alone with the encapsulating and agglomerating agents. These agents modify the physical properties of the bulk sweetener and control its release from chewing gum. Since polydextrose is highly soluble in water as noted earlier, controlling the release of polydextrose modifies the texture and flavor of the chewing gum.

Physical modifications of the bulk sweetener by encapsulation with another substrate will slow its release in chewing gum by reducing the solubility or dissolution rate. Any standard technique which gives

partial or full encapsulation of the bulk sweetener can be used. These techniques include, but are not limited to, spray drying, spray chilling, fluid-bed coating and coacervation. These encapsulation techniques that give partial encapsulation or full encapsulation can be used individually or in any combination in a single step process or multiple step process. Generally, delayed release of bulk sweetener is obtained in multistep processes like spray drying the bulk sweetener and then fluid-bed coating the resultant powder.

The encapsulation techniques here described are standard coating techniques and generally give varying degrees of coating from partial to full coating, depending on the coating composition used in the process. Also, the coating compositions may be susceptible to water permeation to various degrees. Generally, compositions that have high organic solubility, good film-forming properties and low water solubility give better delayed release of the bulk sweetener. Such compositions include acrylic polymers and copolymers, carboxyvinyl polymer, polyamides, polystyrene, polyvinyl acetate, polyvinyl acetate phthalate, polyvinylpyrrolidone, and waxes. Although all of these materials are possible for encapsulation of the bulk sweetener, only food-grade material should be considered. Two standard food-grade coating materials that are good film formers but not water soluble are shellac and zein. Others which are more water soluble, but good film formers, are materials like agar, alginates, a wide range of cellulose derivatives like ethyl cellulose, methyl cellulose, sodium hydroxymethyl cellulose, and hydroxypropylmethyl cellulose, dextrin, gelatin, and modified starches. These ingredients, which are generally approved for food use, also psgive a delayed release when used as an encapsulant. Other encapsulants, like acacia or

maltodextrin, can also encapsulate polydextrose but may increase the release rate of the bulk sweetener.

The amount of coating or encapsulating material on the bulk sweetener also controls the length of time for its release from chewing gum. Generally, the higher the level of coating the slower the release of the bulk sweetener during mastication. The release rate is generally not instantaneous, but gradual over an extended period of time.

Another method of giving a delayed release of the bulk sweetener is agglomeration of the bulk sweetener with an agglomerating agent which partially coats the bulk sweetener. This method includes the step of mixing the bulk sweetener and agglomerating agent with a small amount of water or solvent. The mixture is prepared in such a way as to have individual wet particles in contact with each other so that a partial coating can be applied. After the water or solvent is removed, the mixture is ground and used as a powdered, coated bulk sweetener.

Materials that can be used as the agglomerating agent are the same as those used in encapsulation mentioned previously. However, since the coating is only a partial encapsulation and the bulk sweetener is very water soluble, some agglomerating agents are more effective in delaying the sweetener release than others. Some of the better agglomerating agents are the organic polymers like acrylic polymers and copolymers, polyvinyl acetate, polyvinylpyrrolidone, waxes, shellac, and zein. Other agglomerating agents are not as effective in giving the bulk sweetener a delayed release as are the polymers, waxes, shellac and zein, but can be used to give some delayed release. These other agglomerating agents include, but are not limited to, agar, alginates, a wide range of cellulose derivatives like ethyl cellu-

lose, methyl cellulose, sodium hydroxymethyl cellulose, hydroxypropylmethyl cellulose, dextrin, gelatin, modified starches, vegetable gums like guar gum, locust bean gum, and carrageenin. Even though the agglomerated bulk sweetener is only partially coated, when the quantity of coating is increased compared to the quantity of the bulk sweetener, the release of the bulk sweetener can be delayed for a longer time during mastication.

The bulk sweetener may be coated in a two-step process or multiple step process. The bulk sweetener may be encapsulated with any of the materials as described previously and then the encapsulated sweetener can be agglomerated as described previously to obtain an encapsulated/agglomerated/bulk sweetener product that could be used in chewing gum to give a delayed release of bulk sweetener.

In another embodiment of this invention, polydextrose sweetener may be absorbed onto another component which is porous and become entrapped in the matrix of the porous component. Common materials used for absorbing the bulk sweetener include, but are not limited to, silicas, silicates, pharmasorb clay, spongelike beads or microbeads, amorphous sugars like spray-dried dextrose, sucrose, alditols, amorphous carbonates and hydroxides, including aluminum and calcium lakes, vegetable gums and other spray dried materials.

Depending on the type of absorbent material and how it is prepared, the amount of bulk sweetener that can be loaded onto the absorbent will vary. Generally materials like polymers, spongelike beads or microbeads, amorphous sugars and alditols and amorphous carbonates and hydroxides absorb about 10% to about 40% of the weight of the absorbent. Other materials like

silica and pharmasorb clays may be able to absorb about 20% to about 80% of the weight of the absorbent.

The general procedure for absorbing the bulk sweetener onto the absorbent is as follows. An absorbent like fumed silica powder can be mixed in a powder blender and an aqueous solution of the bulk sweetener can be sprayed onto the powder as mixing continues. The aqueous solution can be about 30% to 50% solids, and higher solid levels may be used if temperatures up to 90°C are used. Generally water is the solvent, but other solvents like alcohol could also be used if approved for use in food. As the powder mixes, the liquid is sprayed onto the powder. Spraying is stopped before the mix becomes damp. The still free-flowing powder is removed from the mixer and dried to remove the water or other solvent, and ground to a specific particle size.

After the bulk sweetener is absorbed onto an absorbent or fixed onto an absorbent, the fixative/sweetener can be coated by encapsulation. Either full or partial encapsulation may be used, depending on the coating composition used in the process. Full encapsulation may be obtained by coating with a polymer as in spray drying, spray chilling, fluid-bed coating, coacervation, or any other standard technique. A partial encapsulation or coating can be obtained by agglomeration of the fixative/sweetener mixture using any of the materials discussed above.

The three methods of use to obtain a delayed release of bulk sweetener are: (1) encapsulation by spray drying, fluid-bed coating spray chilling and coacervation to give full or partial encapsulation, (2) agglomeration to give partial encapsulation and (3) fixation or entrapment/absorption which also gives partial encapsulation. These three methods, combined in any usable manner which physically isolates the bulk

sweetener, reduces its dissolvability or slows down the release of bulk sweetener, are included in this invention.

Polydextrose may act as an encapsulating or agglomerating agent. Polydextrose may also be used to absorb other ingredients. Polydextrose may be able to encapsulate, agglomerate or entrap/absorb flavors and high-intensity sweeteners like aspartame, alitame, cyclamic acid and its salts, saccharin acid and its salts, acesulfame and its salts, sucralose, hydrochalcones, thaumatin, monellin or combinations thereof. Encapsulation of high-intensity sweeteners with polydextrose may improve the sweetener's shelf life.

Polydextrose may be used with other bulk sweeteners and in combination give unique properties. Polydextrose may be co-dried by various delayed release methods noted above with other bulk sweeteners like palatonase, sucrose, dextrose, lactose, maltose, fructose, corn syrup solids, sorbitol, mannitol, xylitol, maltitol, palatinit and hydrogenated starch hydrolysates for use in sugar and sugar-free chewing gum. Ingredients, including flavors, co-dried, encapsulated, agglomerated or absorbed on polydextrose may show faster release. However, encapsulation of flavors with polydextrose may improve the shelf-life of the flavor ingredient like other bulking agents.

Other methods of treating the polydextrose bulk sweetener to physically isolate the sweetener from other chewing gum ingredients may also have some effect on its release rate and its effect on chewing gum flavor and texture. The bulk sweetener may be added to the liquid inside a liquid center gum product. The center fill of a gum product may comprise one or more carbohydrate syrups, glycerin, thickeners, flavors, acidulants, colors, sugars and sugar alcohols in

conventional amounts. The ingredients are combined in a conventional manner. The bulk sweetener is dissolved in the center-fill liquid and the amount of bulk sweetener added to the center-fill liquid may be about 0.1% to about 20% by weight of the entire chewing gum formula. This method of using polydextrose bulk sweetener in chewing gum can allow for a lower usage level of the bulk sweetener, can give the bulk sweetener a smooth release rate, and can reduce or eliminate any possible reaction of the bulk sweetener with gum base, flavor components or other components, yielding improved shelf stability.

Another method of isolating the polydextrose bulk sweetener from other chewing gum ingredients is to add polydextrose to the dusting compound of a chewing gum. A rolling or dusting compound is applied to the surface of chewing gum as it is formed. This rolling or dusting compound serves to reduce sticking to machinery as it is formed, reduces sticking of the product to machinery as it is wrapped, and sticking to its wrapper after it is wrapped and being stored. The rolling compound comprises polydextrose bulk sweetener alone or in combination with mannitol, sorbitol, sucrose, starch, calcium carbonate, talc, other orally acceptable substances or a combination thereof. The rolling compound constitutes from about 0.25% to about 10.0%, but preferably about 1% to about 3% of weight of the chewing gum composition. The amount of polydextrose bulk sweetener added to the rolling compound is about 0.5% to 100% of the rolling compound, or about 0.005% to about 5% of the chewing gum composition. This method of using polydextrose bulk sweetener in the chewing gum can allow a lower usage level of the bulk sweetener, can give the bulk sweetener a more controlled release rate, and can

reduce or eliminate any possible reaction of the bulk sweetener with gum base, flavor components, or other components, yielding improved shelf stability.

Another method of isolating polydextrose bulk sweetener is to use it in the coating/panning of a pellet chewing gum. Pellet or ball gum is prepared as conventional chewing gum, but formed into pellets that are pillow shaped or into balls. The pellets/balls can be then sugar coated or panned by conventional panning techniques to make a unique sugar-coated pellet gum. The bulk sweetener is very stable and highly water soluble, and can be easily added to a sugar solution prepared for sugar panning. Polydextrose may be combined with sucrose, or used alone in solution as the coating on pellet gum. Polydextrose can also be added as a powder blended with other powders often used in some types of conventional panning procedures. Using polydextrose bulk sweetener isolates the sweetener from other gum ingredients and modifies its release rate in chewing gum. Levels of use of polydextrose may be about 1% to about 100% in the coating and about 0.5% to about 50% of the weight of the chewing gum product. The weight of the coating may be about 20% to about 50% of the weight of the finished gum product.

Conventional panning procedures genenerally coat with sucrose, but recent advances in panning have allowed the use of other carbohydrate materials to be used in the place of sucrose. Some of these components include, but are not limited to, dextrose, maltose, xylitol, lactitol, palatinit and other new alditols or a combination thereof. These materials may be blended with panning modifiers including, but not limited to, gum arabic, maltodextrins, corn syrup, gelatin, cellulose type materials like carboxymethyl cellulose, or hydroxymethyl cellulose, starch and modified

starches, vegetable gums like alginates, locust bean gum, guar gum, and gum tragacanth, insoluble carbonates like calcium carbonate or magnesium carbonate and talc. Polydextrose also acts as a panning modifier with other panning materials to improve product quality. Antitack agents may also be added as panning modifiers which allow the use of a variety of carbohydrates and sugar alcohols to be used in the development of new panned or coated gum products. Flavors may also be added with the sugar coating and with the polydextrose bulk sweetener to yield unique product characteristics.

The previously described encapsulated, agglomerated, or absorbed polydextrose bulk sweetener may readily be incorporated into a chewing gum composition. The remainder of the chewing gum ingredients are noncritical to the present invention. That is, the coated particles of bulk sweetener can be incorporated into conventional chewing gum formulations in a conventional manner. The polydextrose bulk sweeteners may be used in a sugar-free or sugar chewing gum to modify the sweetness thereof. The coated bulk sweetener may be used in either regular chewing gum or bubble gum.

In general, a chewing gum composition typically comprises a water-soluble bulk portion, a water-insoluble chewable gum base portion and typically water-insoluble flavoring agents. The water-soluble portion dissipates with a portion of the flavoring agent over a period of time during chewing. The gum base portion is retained in the mouth throughout the chew.

The insoluble gum base generally comprises elastomers, resins, fats and oils, waxes, softeners and inorganic fillers. Elastomers may include

polyisobutylene, isobutylene-isoprene copolymer and styrene butadiene rubber, as well as natural latexes such as chicle. Resins include polyvinylacetate and terpene resins. Fats and oils may also be included in the gum base, including tallow, hydrogenated and partially hydrogenated vegetable oils, and cocoa butter. Commonly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba. According to the preferred embodiment of the present invention, the insoluble gum base constitutes between about 5 to about 95% by weight of the gum. More preferably the insoluble gum base comprises between 10 and 50 percent by weight of the gum and most preferably about 20 to about 35% by weight of the gum.

The gum base typically also includes a filler component. The filler component may be calcium carbonate, magnesium carbonate, talc, dicalcium phosphate or the like. The filler may constitute between about 5 and about 60% by weight of the gum base. Preferably, the filler comprises about 5 to about 50% by weight of the gum base.

Gum bases typically also contain softeners, including glycerol monostearate and glycerol triacetate. Further, gum bases may also contain optional ingredients such as antioxidants, colors, and emulsifiers. The present invention contemplates employing any commercially acceptable gum base.

The water-soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5 to about 15.0% by weight of the chewing gum. Softeners contemplated by the present invention include glycerin, lecithin,

and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolysates, corn syrup and combinations thereof may be used as softeners and binding agents in gum.

As mentioned above, the polydextrose solids/ syrup bulk sweetener of the present invention will most likely be used in sugar gum formulations. However, sugar-free formulations are also within the scope of the invention. Sugar sweeteners generally include saccharide-containing components commonly known in the chewing gum art which comprise, but are not limited to, sucrose, dextrose, maltose, dextrin, dried invert sugar, fructose, levulose, galactose, corn syrup solids and the like, alone or in any combination.

The polydextrose solids/syrup bulk sweetener of the present invention can also be used in combination with sugarless sweeteners. Generally sugarless sweeteners include components with sweetening characteristics but which are devoid of the commonly known sugars and comprise, but are not limited to, sugar alcohols such as sorbitol, mannitol, xylitol, hydrogenated starch hydrolysates, maltitol and the like, alone or in any combination.

Depending on the particular sweetness release profile and shelf-stability needed, the polydextrose solid/syrup bulk sweeteners of the present invention can also be used in combination with coated or uncoated high-potency sweeteners or with high-potency sweeteners coated with other materials and by other techniques.

A flavoring agent may be present in the chewing gum in an amount within the range of from about 0.1 to about 10.0 weight percent and preferably from about 0.5 to about 3.0 weight percent of the gum. The flavoring agents may comprise essential oils, synthetic flavors, or mixture thereof including, but not limited

to, oils derived from plants and fruits such as citrus oils, fruit essences, peppermint oil, spearmint oil, clove oil, oil of wintergreen, anise, and the like. Artificial flavoring components are also contemplated for use in gums of the present invention. Those skilled in the art will recognize that natural and artificial flavoring agents may be combined in any sensorally acceptable blend. All such flavors and flavor blends are contemplated by the present invention.

Optional ingredients such as colors, emulsifiers and pharmaceutical agents may be added to the chewing gum.

In general, chewing gum is manufactured by sequentially adding the various chewing gum ingredients to a commercially available mixer known in the art. After the ingredients have been thoroughly mixed, the gum mass is discharged from the mixer and shaped into the desired form such as by rolling into sheets and cutting into sticks, extruding into chunks or casting into pellets.

Generally, the ingredients are mixed by first melting the gum base and adding it to the running mixer. The base may also be melted in the mixer itself. Color or emulsifiers may also be added at this time. A softener such as glycerin may also be added at this time, along with syrup and a portion of the bulking agent/sweetener. Further portions of the bulking agent/sweetener may then be added to the mixer. A flavoring agent is typically added with the final portion of the bulking agent. A high-intensity sweetener is preferably added after the final portion of bulking agent and flavor have been added.

The entire mixing procedure typically takes from five to fifteen minutes, but longer mixing times

may sometimes be required. Those skilled in the art will recognize that many variations of the above described procedure may be followed.

EXAMPLES

The following examples of the invention and comparative examples are provided by way of explanation and illustration.

The formulas listed in Table 1 comprise various sugar-type formulas in which polydextrose can be added to gum after it is dissolved in water and mixed with various aqueous solvents.

TABLE 1

(WEIGHT PERCENT)

	EX. 1	EX. 2	EX. 3	EX. 4	EX. 5	EX. 6	EX. 7	EX. 8
SUGAR	55.6	56.6	55.6	47.0	53.0	53.0	55.6	47.0
BASE	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	1.9	8.9	2.9	6.9	6.9	0.0	2.9
PEPPER-MINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
GLY-CERIN	1.4	1.4	1.4	0.0	0.0	0.0	1.4	0.0
LIQUID/ LITESSE BLEND	10.0	20.0	14.0	30.0	20.0	20.0	22.9	30.0

EXAMPLE 1

Litesse powder can be added directly to the gum.

EXAMPLE 2

An 80 gram portion of Litesse can be dissolved in 100 grams of water at 40°C making a 50% solution and added to gum.

EXAMPLE 3

Litesse syrup at 80% solids can be added directly to the gum.

EXAMPLE 4

A blend of 100 grams of Litesse and 120 grams of water is mixed at 40°C. To this is added 100 grams of glycerin to give a mixture of 27% Litesse, 40% water, and 33% glycerin, and added to gum.

EXAMPLE 5

To 140 grams of Litesse syrup at 70% solids is added 60 grams of glycerin to give a 70% Litesse syrup with 30% glycerin, and added to gum.

EXAMPLE 6

To 140 grams of Litesse syrup of 70% solids is added 60 grams of propylene glycol giving a 70% Litesse syrup with 30% glycerin and added to gum.

EXAMPLE 7

To 140 grams of Litesse syrup at 70% solids is added 89 grams of corn syrup and blended giving a mixture of 61% Litesse syrup and 39% corn syrup.

EXAMPLE 8

To a 200 gram quantity of corn syrup is added 100 grams of glycerin. To this mixture is added 75 grams of Litesse and blended at 50°C. This mixture is added to gum.

In the next examples of sugar gum formulations, polydextrose can be dissolved in water and emulsifiers can be added to the aqueous solution. Example solutions can be prepared by dissolving 15 grams of polydextrose in 70 grams water and adding 15 grams of emulsifiers of various hydrophilic-lipophilic balance (HLB) values to the solution. The mixtures can then be used in the following formulas.

TABLE 2
(WEIGHT PERCENT)

	EX. 9	EX. 10	EX. 11	EX. 12	EX. 13	EX. 14
SUGAR	50.7	50.7	50.7	50.7	50.7	50.7
BASE	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	12.9	12.9	12.9	12.9	12.9
GLY-CERIN	1.4	1.4	1.4	1.4	1.4	1.4
DEX-TROSE MONOHY-DRATE	9.9	9.9	9.9	9.9	9.9	9.9
PEPP. FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
BULK SWEET-ENER/ EMUL-SIFIER/ WATER MIXTURE	5.0	5.0	5.0	5.0	5.0	5.0
	None	HLB=2	HLB=4	HLB=6	HLB=9	HLB=12

EXAMPLES 15-20

The same as the formulations made in Examples 9-14, respectively, except that the flavor can be mixed together with the aqueous bulk sweetener solution and emulsified before adding the mixture to the gum batch.

Polydextrose bulk sweetener can also be blended into various base ingredients. A typical base formula is as follows:

	WEIGHT PERCENT
Polyvinyl acetate	27
Synthetic rubber	13
Paraffin Wax	13
Fat	3
Glycerol Monostearate	5
Terpene Resin	27
Calcium Carbonate Filler	12
	100%

The individual base components can be softened prior to their addition in the base manufacturing process. To the presoftened base component, polydextrose can be added and mixed, and then the presoftened base/bulk sweetener blend can be added to make the finished base. In the following examples, polydextrose can be mixed first with one of the base ingredients, and the mixed ingredient can then be used in making a base. The ingredients blended with polydextrose can then be used at the levels indicated in the typical base formula above.

EXAMPLE 21

The terpene resin used to make the base is 80% polyterpene resin and 20% Litesse.

EXAMPLE 22

The polyvinyl acetate used to make the base is 80% low M.W. polyvinyl acetate and 20% Litesse.

Polydextrose may also be added to an otherwise complete gum base.

EXAMPLE 23

5% polydextrose can be mixed with 95% of a gum base having the above listed typical formula. The polydextrose can be added near the end of the process, after all the other ingredients are added.

The samples of finished base made with polydextrose added to different base components can then be evaluated in a sugar-type chewing gum formulated as follows:

TABLE 3

(WEIGHT PERCENT)

(For examples 21, 22, and 23)

Sugar	55.2
Base	19.2
Corn Syrup	13.4
Glycerine	1.4
Dextrose Monohydrate	9.9
Peppermint Flavor	0.9
	100%

The theoretical level of polydextrose bulk sweetener is 1% in the finished gum.

The following Tables 4 through 11 are examples of gum formulations that demonstrate formula variations in which polydextrose, in the form of polydextrose A, polydextrose K, polydextrose N 70% syrup, and Litesse brand polydextrose.

Examples 24-28 in Table 4 demonstrates the use of polydextrose in low-moisture sugar formulations showing less than 2% theoretical moisture:

TABLE 4
(WEIGHT PERCENT)

	EX. 24	EX. 25	EX. 26	EX. 27	EX. 28
SUGAR	57.9	53.9	48.9	25.0	0.0
GUM BASE	19.2	19.2	19.2	19.2	19.2
CORN SYRUP[a]	6.0	6.0	6.0	6.0	6.0
DEXTROSE MONOHY-DRATE	10.0	10.0	10.0	10.0	10.0
LACTOSE	0.0	0.0	0.0	5.0	5.0
GLYCERIN[b]	5.0	5.0	5.0	8.9	8.9
FLAVOR	0.9	0.9	0.9	0.9	0.9
LITESSE	1.0	5.0	10.0	25.0	50.0

[a]Corn Syrup is evaporated to 85% solids, 15% moisture

[b]Glycerin and syrup may be blended and co-evaporated

Examples 29-33 in Table 5 demonstrate the use of polydextrose in medium-moisture sugar formulations having about 2% to about 5% moisture.

Examples 34-38 in Table 6 demonstrate the use of polydextrose in high-moisture sugar formulations having more than about 5% moisture.

TABLE 5
(WEIGHT PERCENT)

	EX. 29	EX. 30	EX. 31	EX. 32	EX. 33
SUGAR	52.5	48.5	43.5	25.0	0.0
GUM BASE	19.2	19.2	19.2	19.2	19.2
CORN SYRUP[a]	15.0	15.0	15.0	18.5	18.5
DEXTROSE MONOHY-DRATE	10.0	10.0	10.0	10.0	10.0
GLYCERIN[b]	1.4	1.4	1.4	1.4	1.4
FLAVOR	0.9	0.9	0.9	0.9	0.9
LITESSE	1.0	5.0	10.0	25.0	50.0

[a]Corn Syrup is evaporated to 85% solids, 15% moisture

[b]Glycerin and syrup may be blended and co-evaporated

TABLE 6
(WEIGHT PERCENT)

	EX. 34	EX. 35	EX. 36	EX. 37	EX. 38
SUGAR	50.0	46.0	41.0	25.0	0.0
GUM BASE	24.0	24.0	24.0	24.0	24.0
CORN SYRUP	24.0	24.0	24.0	24.6	24.6
GLYCERIN	0.0	0.0	0.0	0.4	0.4
FLAVOR	1.0	1.0	1.0	1.0	1.0
LITESSE	1.0	5.0	10.0	25.0	50.0

Examples 39-43 in Table 7 and Examples 44-53 in Tables 8 and 9 demonstrate the use of polydextrose in low- and high-moisture gums that are sugar-free. Low-moisture gums have less than about 2% moisture, and high-moisture gums have greater than 2% moisture.

TABLE 7
(WEIGHT PERCENT)

	EX. 39	EX. 40	EX. 41	EX. 42	EX. 43
BASE	25.5	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	41.0	26.0	0.0
MANNITOL	12.0	12.0	12.0	12.0	13.0
GLYCERIN	10.0	10.0	10.0	10.0	10.0
FLAVOR	1.5	1.5	1.5	1.5	1.5
LITESSE	1.0	5.0	10.0	25.0	50.0

TABLE 8
(WEIGHT PERCENT)

	EX. 44	EX. 45	EX. 46	EX. 47	EX. 48
BASE	25.5	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	41.0	26.0	0.0
LIQUID SORBITOL*	10.0	10.0	10.0	10.0	11.0
MANNITOL	10.0	10.0	10.0	10.0	10.0
GLYCERIN	2.0	2.0	2.0	2.0	2.0
FLAVOR	1.5	1.5	1.5	1.5	1.5
LITESSE	1.0	5.0	10.0	25.0	50.0

*Sorbitol liquid contains 70% sorbitol, 30% water

TABLE 9
(WEIGHT PERCENT)

	EX. 49	EX. 50	EX. 51	EX. 52	EX. 53
BASE	25.5	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	41.0	26.0	0.0
HSH SYRUP*	10.0	10.0	10.0	10.0	10.0
MANNITOL	8.0	8.0	8.0	8.0	9.0
GLYCERIN**	4.0	4.0	4.0	4.0	4.0
FLAVOR	1.5	1.5	1.5	1.5	1.5
LITESSE	1.0	5.0	10.0	25.0	50.0

* Lycasin brand hydrogenated starch hydrolysate syrup
** Glycerin and HSH syrup may be blended or co-evaporated

Table 10 shows sugar chewing gum formulations that can be made with polydextrose and various other types of sugars.

TABLE 10
(WEIGHT PERCENT)

	EX. 54	EX. 55	EX. 56	EX. 57	EX. 58	EX. 59
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	44.5	24.5	39.5	19.5	29.5	19.5
GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
CORN SYRUP	14.0	14.0	14.0	14.0	14.0	14.0
DEXTROSE	5.0	5.0	-	-	10.0	5.0
LACTOSE	5.0	5.0	10.0	10.0	-	-
FRUCTOSE	5.0	5.0	10.0	10.0	10.0	5.0
INVERT SUGAR	-	-	-	-	10.0	10.0
MALTOSE	-	-	-	-	-	-
CORN SYRUP SOLIDS	-	-	-	-	-	-
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
LITESSE	5.0	25.0	5.0	25.0	5.0	25.0

	EX. 60	EX. 61	EX. 62	EX. 63	EX. 64	EX. 65
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	29.5	19.5	29.5	19.5	37.5	22.5
GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
CORN SYRUP	14.0	14.0	14.0	14.0	11.0	11.0
DEXTROSE	10.0	5.0	10.0	5.0	10.0	5.0
LACTOSE	-	-	-	-	-	-
FRUCTOSE	10.0	5.0	10.0	5.0	5.0	5.0
INVERT SUGAR	10.0	10.0	-	-	5.0	5.0
MALTOSE	-	-	10.0	10.0	-	-
CORN SYRUP SOLIDS	-	-	-	-	5.0	5.0
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
LITESSE	5.0	25.0	5.0	25.0	5.0	25.0

Any of the sugars may be combined with polydextrose and co-dried to form unique combinations such as:

EXAMPLE 66

Dextrose and Litesse can be dissolved in water in a 2:1 ratio of dextrose:Litesse and co-dried or co-precipitated and used in the formulas in Table 10.

EXAMPLE 67

Litesse and sucrose can be dissolved in water in a 1:1 ratio and co-dried or co-precipitated and used in the formulas in Table 10.

EXAMPLE 68

Litesse, sucrose, and dextrose can be dissolved in water in a 1:1:1 ratio and co-dried or co-precipitated and used in the formulas in Table 10.

EXAMPLE 69

Litesse, sucrose, dextrose, and fructose can be dissolved in water at 25% of each ingredient and co-dried, and used in the formulas in Table 10.

EXAMPLE 70

Litesse, dextrose, fructose, and lactose can be dissolved in water at 25% of each ingredient and co-dried, and used in the formulas in Table 10.

EXAMPLE 71

Litesse, dextrose, maltose, and corn syrup solids can be dissolved in water at 25% of each ingredient and co-dried, and used in the formulas in Table 10.

EXAMPLE 72

Litesse, sucrose, dextrose, maltose and fructose can be dissolved in water at 20% of each ingredient and co-dried, and used in the formulas in Table 10.

Multiple combinations of polydextrose with other sugars can be made in solution to form liquid concentrates that do not need to be co-dried, such as:

EXAMPLE 73

Litesse, corn syrup and glycerin can be dissolved in water at a ratio of 1:1:1, evaporated to a thick syrup and used in the formulas in Table 10.

EXAMPLE 74

Litesse, dextrose, fructose and invert syrup may be dissolved in water at 25% of each ingredient and evaporated to a thick syrup and used in the formulas in Table 10.

EXAMPLE 75

Litesse, dextrose, maltose and and corn syrup solids may be dissolved in water at 25 % of each component and evaporated to a thick syrup and used in the formulas in Table 10.

EXAMPLE 76

Glycerin is added to Example 74 at a ratio of 4:1 syrup to glycerin and evaporated to a thick syrup, and used in the formulas in Table 10.

EXAMPLE 77

Glycerin is added to Example 75 at a ratio of 2:1 syrup to glycerin and evaporated to a thick syrup, and used in the formulas in Table 10.

Multiple combinations of two or three sugars can also be made by melting a sugar at about 130°C, blending with melted polydextrose, cooling, and grinding to form powder blends such as:

EXAMPLE 78

Dextrose and Litesse melted at 130°C and blended at a ratio of 1:1, cooled, ground, and used in formulas in Table 10.

EXAMPLE 79

Dextrose and fructose and Litesse at a ratio of 1:1:1 are blended and melted at 130°C. The melted blend is cooled, ground, and used in formulas in Table 10.

Table 11 shows chewing gum formulations that are free of sugar. These formulations can use a wide variety of other non-sugar alditols.

TABLE 11
(WEIGHT PERCENT)

	EX. 80	EX. 81	EX. 82	EX. 83	EX. 84	EX. 85
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	2.0	2.0	2.0	2.0	2.0	2.0
SORBITOL	44.0	34.0	34.0	29.0	28.0	-
MANNITOL	-	10.0	10.0	10.0	10.0	6.0
SORBITOL LIQUID	17.0	17.0	-	-	-	-
LYCASIN HSH SYRUP	-	-	17.0	12.0	8.0	10.0
MALTITOL	-	-	-	10.0	-	-
XYLITOL	-	-	-	-	15.0	15.0
LACTITOL	-	-	-	-	-	-
PALATINIT	-	-	-	-	-	-
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
LITESSE	10.0	10.0	10.0	10.0	10.0	40.0

	EX. 86	EX. 87	EX. 88	EX. 89	EX. 90	EX. 91
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	8.0	8.0	8.0	2.0	3.0	2.0
SORBITOL	32.0	27.0	22.0	31.0	10.0	-
MANNITOL	8.0	8.0	8.0	-	-	-
SORBITOL LIQUID	5.0	-	-	-	-	-
LYCASIN HSH SYRUP	-	5.0	5.0	5.0	10.0	10.0
MALTITOL	-	5.0	-	-	-	-
XYLITOL	-	-	-	15.0	-	-
LACTITOL	10.0	10.0	10.0	-	-	-
PALATINIT	-	-	10.0	10.0	25.0	21.0
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
LITESSE	10.0	10.0	10.0	10.0	25.0	40.0

Any of the alditols can be combined with polydextrose and co-dried to form unique combinations, such as:

EXAMPLE 92

Litesse and sorbitol can be dissolved in water in a ratio of 2:1 sorbitol:Litesse and co-dried and used in formulas in Table 11.

EXAMPLE 93

Litesse, sorbitol, and mannitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 94

Litesse, mannitol and xylitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 95

Litesse, sorbitol, and lactitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 96

Litesse, palatinit, and sorbitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 97

Litesse and palatinit can be dissolved in water at a ratio of 1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 98

Litesse, sorbitol, maltitol, and xylitol may be blended at 25% of each ingredient and dissolved in water, co-dried, and used in appropriate formulas in Table 11.

Multiple combinations of polydextrose with the various alditols can be made in solution to form

liquid concentrates that do not need to be co-dried, such as:

EXAMPLE 99

Litesse, sorbitol, maltitol, and Lycasin brand HSH syrup may be dissolved in water at 25% of each ingredient, evaporated to a thick syrup and used in the appropriate formulas in Table 11.

EXAMPLE 100

Litesse, xylitol, sorbitol, and Lycasin brand HSH syrup can be dissolved in water at 25% of each ingredient, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 101

Litesse, sorbitol, lactitol, and Lycasin brand HSH syrup can be dissolved in water at 25% of each ingredient, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 102

Litesse, Lycasin brand HSH syrup and glycerin can be dissolved in water at a ratio of 1:1:1, evaporated to a thick syrup and used in the formulas in Table 11.

EXAMPLE 103

Glycerin is added to Example 99 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in formulas in Table 11.

EXAMPLE 104

Glycerin is added to Example 100 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 105

Glycerin is added to Example 101 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in formulas in Table 11.

Multiple combinations and combinations of one or two alditols with polydextrose can be made by melting the alditols together at about 130°C, blending with melted polydextrose, cooling, and grinding to form powder blends, such as:

EXAMPLE 106

Sorbitol and Litesse are melted at 130°C, blended at a 1:1 ratio, cooled, ground and used in formulas in Table 11.

EXAMPLE 107

Sorbitol, xylitol and Litesse are blended at a 1:1:1 ratio and melted at 130°C. The blend is cooled, ground and used in formulas in Table 11.

High-intensity sweeteners such as aspartame, acesulfame K, or the salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be used in any of the Examples listed in Tables 4, 5, 6, 7, 8 9, 10 and 11. Since polydextrose has less sweetness than some of the other sugars used in sugar gum, and some of the alditols in sugar-free gum, a high-intensity sweetener may be need to obtain the proper level of sweetness.

High-intensity sweeteners may also be modified to control their release in chewing gum formulations containing polydextrose. This can be controlled by various methods of encapsulation, agglomeration, absorption, or a combination of methods to obtain either a fast or slow release of the sweetener. Sweetener combinations, some of which may be synergistic, may also be included in the gum formulations containing polydextrose.

The following examples show the use of high-intensity sweeteners in chewing gum formulations with polydextrose.

EXAMPLE 108

Aspartame at a level of 0.2% may be added to any of the formulas in Tables 4 through 11 by replacing 0.2% of the Litesse.

EXAMPLE 109

Alitame at a level of 0.03% may be added to any of the formulas in Tables 4 through 11 by replacing 0.03% of the Litesse.

EXAMPLE 110

Sucralose at a level of 0.07% may be added to any of the formulas in Tables 4 through 11 by replacing 0.07% of the Litesse.

EXAMPLE 111

Thaumatin at a level of 0.02% may be added to any of the formulas in Tables 4 through 11 by replacing 0.02% of the Litesse.

EXAMPLE 112

Glycyrrhizin at a level of 0.4% may be added to any of the formulas in Tables 4 through 11 by replacing 0.4% of the Litesse.

High-intensity sweeteners may also be combined with other high-intensity sweeteners, with or without encapsulation, agglomeration or absorption, and used in chewing gums of the present invention. Examples are:

EXAMPLE 113

Aspartame and acesulfame K at a 1:1 ratio may be added to any of the formulas in Tables 4 through 11 at a level of 0.15% by replacing 0.15% of the Litesse.

EXAMPLE 114

Aspartame and alitame at a ratio of 9:1 aspartame: alitame may be added to any of the formulas in Tables 4 through 11 at a level of 0.1% by replacing 0.1% of the Litesse.

EXAMPLE 115

Aspartame and thaumatin at a ratio of 9:1 aspartame:thaumatin can be added to any of the formulas in Tables 4 through 11 at a level of 0.1% by replacing 0.1% of the Litesse.

EXAMPLE 116

Sucralose and alitame in a ratio of 3:1 sucralose: alitame can be added to any of the formulas in Tables 4 through 11 at a level of 0.05% by replacing 0.05% of the Litesse.

EXAMPLE 117

Alitame and glycyrrhizin in a ratio of 1:12 alitame:glycyrrhizin can be added to any of the formulas in Tables 4 through 11 at a level of 0.1% by replacing 0.1% of the Litesse.

EXAMPLE 118

Aspartame and glycyrrhizin in a ratio of 1:14 aspartame:glycyrrhizin can be added to any of the formulas in Tables 4 through 11 at a level of 0.3% by replacing 0.3% of the Litesse.

As discussed above, the various types of polydextrose ingredients that are available are polydextrose A, polydextrose K, polydextrose N 70% syrup and Litesse brand polydextrose. These materials may be used as the exclusive bulk sweetener in a variety of chewing gum formulations, as in Tables 12 and 13.

TABLE 12
(WEIGHT PERCENT)

	EX. 119	EX. 120	EX. 121	EX. 122	EX. 123
GUM BASE	19.2	25.5	25.5	25.5	40.0
GLYCERIN	2.0	2.0	7.0	10.0	2.0
LITESSE	57.8	51.0	51.0	53.0	40.5
LITESSE SYRUP	20.0	20.0	15.0	10.0	15.0
FLAVOR	1.0	1.5	1.5	1.5	2.5

Litesse powder or syrup may also be preblended with glycerin and coevaporated to reduce moisture.

TABLE 13
(WEIGHT PERCENT)

	EX. 124	EX. 125	EX. 126	EX. 127	EX. 128	EX. 129	EX. 130
GUM BASE	25.5	25.5	25.5	25.5	50.0	70.0	25.5
GLYCERIN	2.0	2.0	7.0	15.0	2.0	1.0	-
LITESSE POWDER	56.0	56.0	51.0	48.0	39.5	26.0	73.0
LITESSE SYRUP	15.0	15.0	15.0	10.0	6.0	-	-
FLAVOR	1.5	1.5	1.5	1.5	2.5	3.0	1.5

The formulations in Tables 12 and 13 do not contain other sugars or alditols. These formulations will give unique texture and flavor attributes. These formulations may also contain high-intensity, artificial sweeteners, from about 0.02% to about 0.1% for sweeteners like alitame, thaumatin, and dihydrochalcone, and from about 0.1% to about 0.3% for sweeteners like aspartame, sucralose, acesulfame, and saccharin. The formulations in Tables 12 and 13 without the other types of sugars and alditols will also have good non-cariogenic and low caloric properties.

Polydextrose may also be codried with high intensity, artificial sweeteners by spray drying, fluid bed coating, spray congealing, or agglomeration, and used in the formulations in Tables 12 and 13 at active levels of the various high intensity sweeteners noted above.

It should be appreciated that the compositions and methods of the present invention are capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The invention may be embodied in other forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention is therefore indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

WE CLAIM:

1. A chewing gum product including polydextrose wherein the polydextrose is used as a dusting agent on the surface of the gum.

2. A method of making chewing gum comprising the steps of:

a) coevaporating an aqueous solution comprising polydextrose and a plasticizing agent to form a syrup, and

b) mixing the syrup with gum base, bulking agents and flavoring agents to produce a gum composition.

3. A chewing gum composition sweetened at least in part by aspartame, the gum composition containing an effective amount of polydextrose to stabilize the aspartame against degradation into non-sweetening derivatives.

4. A chewing gum composition sweetened at least in part by alitame, the gum composition containing an effective amount of polydextrose to stabilize the alitame against degradation into non-sweetening derivatives.

5. A method of making chewing gum comprising the steps of:

a) codrying a solution containing polydextrose and another sweetener selected from the group consisting of sugar sweeteners, alditol sweeteners and high-potency sweeteners, and

b) mixing the codried polydextrose/sweetener with gum base and flavoring agents to produce a gum composition.